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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,817	10/23/2003	Mark Lynn Jenson	1327.007US2	1105

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EXAMINER

DIAMOND, ALAN D

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 02/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/693,817

Applicant(s)

JENSON ET AL.

Examiner

Alan Diamond

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 November 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>10/23/03, 11/12/04, 12/15/04</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings filed November 12, 2004 are objected to because none of the drawing sheets have been labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). As noted below in the instant paragraph, each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: On page 1, at line 8, the term "09 815,621" should be changed to "09/815,621". On page 1, at line 8, the term "now abandoned" should be inserted before the word "titled". On page 1, at line 24, the term "now U.S. Patent 6,805,998" should be inserted before the word "titled". On page 27, at line 26, the term "adatoms" should be changed to "atoms". Appropriate correction is required.

Claim Objections

3. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 4-20 have been renumbered 3-19, respectively. The dependency of some of the dependent claims has also been changed. Original claim 11, which is now renumbered claim 10, depends from renumbered claim 9. Original claim 19, which is now renumbered claim 18, depends from renumbered claim 17.

Claims 1-19 are pending in the instant application.

4. Claims 1, 17, and 19 are objected to because of the following informalities: In claim 1 at line 6, in claim 17 at line 6, and in claim 19 at line 7, the term "third, film" should be changed to "third film,". In claim 17, at line 3, the word "a" should be changed to "an". Appropriate correction is required.

Suggested Claim Language

5. In claim 1 at line 9, and in claim 17 at line 9, it is suggested that "focussed" be changed to "focused".

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1 at line 10, in claim 17 at line 10, and in claim 19 at line 12, the term "highly ordered crystalline film structure" is indefinite because it is subjective. The metes and bounds for the claims cannot be determined. It is not clear where the boundary lies to distinguish something that has a highly ordered crystalline film structure, as opposed to something that, for example, has a crystalline structure that is ordered, but not "highly ordered". The same applies to dependent claims 2-16 and 18.

Claim 10 is indefinite because "the cadmium" at line 2 (two occurrences) lacks positive antecedent support in claim 9. It is suggested that the first occurrence of "the cadmium" at line 2 be changed to "cadmium".

In claim 15, at line 2, the term "high quality" is indefinite because it is subjective.

Claim 16 is indefinite because "the cell" at line 3 lacks positive antecedents support in claim 1.

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Claim 16 is also indefinite because "the means supplying energy" at line 4 lacks positive antecedent support in claim 1. It is suggested that "the" at line 4 be changed to "a".

In claim 18, at line 2, the term "high quality" is indefinite because it is subjective.

Claim Rejections - 35 USC § 102/103

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 17 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Tyan (U.S. Patent 4,207,119).

Tyan teaches a photovoltaic (PV) cell comprising a transparent substrate (14) having a first electrode (16) formed thereon, a first semiconductor polycrystalline n-type CdS film (18) formed on the first electrode (16), a second semiconductor p-type CdTe

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film (20) formed on the first semiconductor film (18), and a second electrode (22) formed on the second semiconductor film (20) (see abstract; col. 2, lines 34-42; col. 3, lines 7-16; col. 6, lines 12-29; and Figure 2). It is the Examiner's position that the polycrystalline CdS and CdTe films prepared in Tyan's Example 1 at cols. 6 and 7, as well as in Examples 5-11 at col. 8, have a "highly ordered crystalline film structure" as here claimed. Since Tyan teaches the limitations of the instant claim, the reference is deemed to be anticipatory.

In the event any differences can be shown for the product of the product-by-process claim 17, as opposed to the product taught by the reference Tyan, such differences would have been obvious to one of ordinary skill in the art as a routine modification of the product in the absence of a showing of unexpected results; see also In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985).

11. Claim 17 is rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Walpita (U.S. Patent 6,236,061).

Walpita discloses a method of making a PV cell using ion-assisted e-beam evaporation (see col. 6, lines 11-12). The PV cell (60) comprises a substrate (64) having an electrode film (64) formed thereon, a first semiconductor layer (68) and a second semiconductor layer (70), and a second electrode film (76) formed on the second semiconductor layer (70) (see col. 7, lines 32-55; and Figure 4). Walpita teaches the surface of p-type silicon layer (70) is annealed by laser (col. 7, lines 49-53), and it is the Examiner's position that this annealed p-type silicon layer has a "highly

ordered crystalline film structure" as here claimed. Since Walpita teaches the limitations of the instant claim, the reference is deemed to be anticipatory.

In the event any differences can be shown for the product of the product-by-process claim 17, as opposed to the product taught by the reference Walpita, such differences would have been obvious to one of ordinary skill in the art as a routine modification of the product in the absence of a showing of unexpected results; see also In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985).

Claim Rejections - 35 USC § 103

12. Claims 1-5, 7-13, 16, 17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tyan (U.S. Patent 4,207,119) in view of Armini et al (U.S. Patent 4,353,160) and Ovshinsky (U.S. Patent 4,520,039).

Regarding claims 1, 17, and 19, Tyan discloses a method of making a photovoltaic (PV) cell comprising a transparent substrate (14) having a first transparent $\text{In}_2\text{O}_3(\text{Sn})$ electrode (16) formed thereon, a first semiconductor polycrystalline n-type CdS film (18) formed on the first electrode (16), a second semiconductor p-type CdTe film (20) formed on the first semiconductor film (18), and a second electrode (22) formed on the second semiconductor film (20) (see abstract; col. 2, lines 34-42; col. 3, lines 7-16; col. 6, lines 12-29; and Figure 2). It is the Examiner's position that the polycrystalline CdS and CdTe films prepared in Tyan's Example 1 at cols. 6 and 7, as well as in Examples 5-11 at col. 8, have a "highly ordered crystalline film structure" as here claimed. Leads (24) are attached to the first and second electrode layers (16, 22) (col. 6, lines 19-20; and Figure 2). The first transparent electrode (16) is provided on the

substrate (14) (see col. 6, lines 12-17) and thus, there most certainly is a means for forming said first transparent electrode (16) on said substrate (14). The semiconductor layers (18, 20) are formed by deposition means by depositing a semiconductor material using a deposition source by supplying energy to the semiconductor material to deposit the material in layers (see col. 3, lines 28-45; and Example 1). Specifically, Tyan discloses the use of "sputtering or ion plating wherein ionized or plasma gas, respectively, is the activating medium" (see col. 3, lines 35-40). These methods form the semiconductor layers by supplying energized particles through ionization or by forming a plasma, which is a charged state of matter wherein an equal number of positively charged and negatively charged ions exist simultaneously. Tyan also deposits dopant material using a vapor phase deposition (see col. 3, lines 60-68). The second electrode (22) is formed on the second semiconductor film (20) (see col. 6, lines 17-19) and thus, there most certainly is a means for forming this electrode (22) on the semiconductor (20).

With respect to claims 2-5, 7-13, and 16, Tyan discloses forming a PV cell comprising a first semiconductor layer (18) of n-type polycrystalline CdS and a second semiconductor layer (20) of p-type polycrystalline CdTe (col. 6, lines 12-29). The semiconductor layers are formed to a thickness of about 0005 microns to about 5 microns, or about 50 nm to about 5000 nm (col. 6, lines 20-25). The semiconductor layers are deposited by a method of supplying energized particles using ion plating or sputtering, therefore supplying sulfur, cadmium and telluride ions to the layers as they are formed. Additionally, Tyan discloses forming the semiconductor layers in the

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presence of oxygen or argon gas, which have ionization energies of 12 eV and 15.75 eV, respectively (col. 7, line 65). The substrate is held at a temperature between about 300 degrees Celsius and 650 degrees Celsius (col. 4, lines 19-22).

The method disclosed by Tyan differs from the instant invention because Tyan does not disclose supplying focused ion energy from a secondary source to the semiconductor material, as recited in claims 1 and 19.

Regarding said claims 1 and 19, Ovshinsky discloses a method for forming layers of materials, which may be deposited by sputtering or plasma deposition, wherein "one ore more ion beams can be combined with a plasma, sputtering or other type of deposition parameters to insert atoms into the material as it is being deposited" (see col. 8, lines 16-30). Ovshinsky further states, "The techniques of the invention can be utilized as a new way of doping photovoltaic materials" (see col. 11, line 53 to col. 12, line 2).

Armini et al teach a method for making solar cells, wherein semiconductors making up the solar cells are doped using an ion implanting step (col. 4, lines 12-24). An ion beam implanter (24) uses an ion source (34) for generating an ion beam (36) which is focused by a lens (40) and directed onto the semiconductor material (col. 4, lines 25-41). This method of ion beam implantation has the advantage of avoiding the use of wet chemistry operations and diffusion masks and does not require cutting for junction isolation (col. 4, lines 12-24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Tyan to use focused ion energy

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using a secondary ion source as taught by Armini et al and Ovshinsky because using a focused ion source to implant atoms allows the dopant particles to be accurately deposited and avoids the use of wet chemistry operations and diffusion masks.

13. Claims 1-6, 11, 12, 14, 17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walpita (U.S. Patent 6,236,061) in view of Armini et al (U.S. Patent 4,353,160) and Ovshinsky (U.S. Patent 4,520,039).

Walpita discloses a method of making a PV cell using ion-assisted e-beam evaporation (see col. 6, lines 11-12). The PV cell (60) comprises a substrate (64) having an electrode film (64) formed thereon, a first semiconductor layer (68) and a second semiconductor layer (70), and a second electrode film (76) formed on the second semiconductor layer (70) (see col. 7, lines 32-55; and Figure 4). Since Walpita teaches forming said electrode film (64), first semiconductor layer (68), semiconductor layer (70), and second electrode film (76), there is certainly a respective means for forming the respective layers. Walpita teaches the surface of p-type silicon layer (70) is annealed by laser (col. 7, lines 49-53), and it is the Examiner's position that this annealed p-type silicon layer has a "highly ordered crystalline film structure" as here claimed. The semiconductor layers (68, 70) are formed using ion-assisted evaporation wherein "the ion beam energy is in the range of 40 to 110 eV and substrate temperature in the range of 25°C to 200°C (see col. 6, lines 9-18). The semiconductor comprises of a material including Si, Sic, GaAs, InGaAs, GaN, and the like (see col. 4, lines 50-53).

The method of Walpita differs from the instant invention because Walpita does not disclose supplying focused ion energy from a secondary source to the semiconductor material, as in claims 1 and 19.

Regarding said claims 1 and 19, Ovshinsky discloses a method for forming layers of materials, which may be deposited by sputtering or plasma deposition, wherein "one ore more ion beams can be combined with a plasma, sputtering or other type of deposition parameters to insert atoms into the material as it is being deposited" (see col. 8, lines 16-30). Ovshinsky further states, "The techniques of the invention can be utilized as a new way of doping photovoltaic materials" (see col. 11, line 53 to col. 12, line 2).

Armini et al teach a method for making solar cells, wherein semiconductors making up the solar cells are doped using an ion implanting step (col. 4, lines 12-24). An ion beam implanter (24) uses an ion source (34) for generating an ion beam (36) which is focused by a lens (40) and directed onto the semiconductor material (col. 4, lines 25-41). This method of ion beam implantation has the advantage of avoiding the use of wet chemistry operations and diffusion masks and does not require cutting for junction isolation (col. 4, lines 12-24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Walpita to use focused ion energy using a secondary ion source as taught by Armini et al and Ovshinsky because using a focused ion source to implant atoms allows the dopant particles to be accurately deposited and avoids the use of wet chemistry operations and diffusion masks.

14. Claims 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walpita in view of Armini et al and Ovshinsky as applied to claims 1-6, 11, 12, 14, 17, and 19 above, and further in view of Shiozaki (U.S. Patent 6,222,117)

Walpita in view of Armini et al and Ovshinsky, as relied upon for the reasons recited above, teaches the limitations of instant claims 15 and 18, the difference being that these references do not disclose forming a high quality region and a highly doped region as in these claims.

Shiozaki discloses a method for forming a PV device wherein the semiconductor layers are formed by depositing the semiconductor materials by plasma chemical vapor deposition, which provides energized particles to the forming layers (col. 6, lines 48-55). Shiozaki discloses, "it is preferable that the joined semiconductor layers comprise an n-type or p-type first semiconductor layer, a weak n-type, weak p-type or i-type second semiconductor layer and a conductive p-type or n-type third semiconductor layer which is different from the first semiconductor layer" (see col. 5, lines 7-15). The use of a weak n-type or p-type layer and a highly doped outer layer increases the conversion efficiency of the PV device by avoiding carrier recombination and decreasing the resistance at the interface between the highly doped region and the electrode.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the step of forming the semiconductor layers in the method of Walpita, Armini et al and Ovshinsky to form a semiconductor film, i.e., Walpita's semiconductor film (70), so as to have a first high-quality region followed by a second region that is highly doped as taught by Shiozaki because forming a first high-

quality region followed by a second highly-doped region increases the conversion efficiency of the PV device. High quality regions increase the conversion efficiency of PV devices because of their lack of defects, and would therefore be desirable throughout the entire semiconductor area.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following U.S. patent applications and patent are hereby made of record: 2001/0032666, 2002/0000034, 2002/0001746, 2002/0001747, 2002/0004167, 2002/0037756, 2004/0131760, 2004/0131761, 2004/0131897, 2004/0131925, 2004/0185310, 2004/0185667, and 6,805,998.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic
Business Center (EBC) at 866-217-9197 (toll-free).

Alan Diamond
Primary Examiner
Art Unit 1753

Alan Diamond
February 4, 2005

A handwritten signature in black ink, appearing to read 'Alan Diamond', with a stylized, cursive script.